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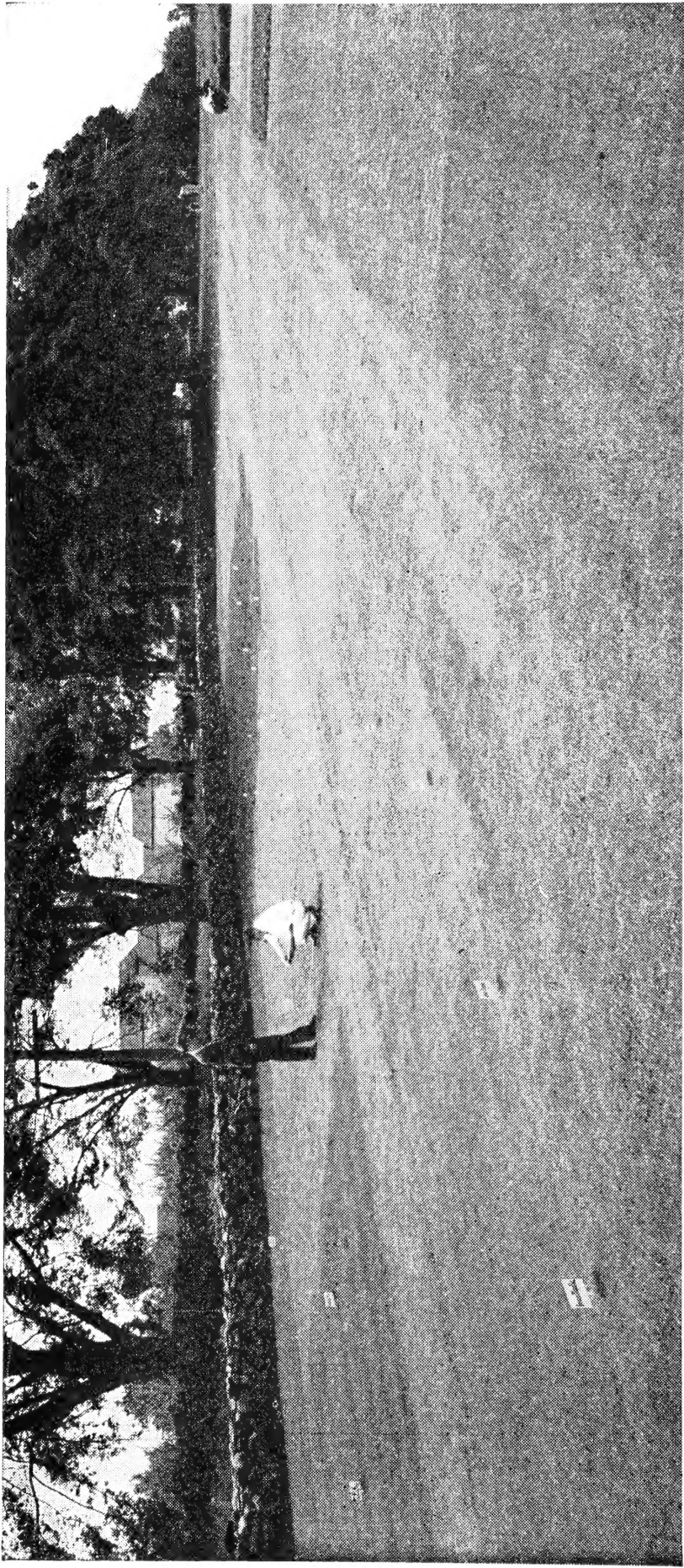




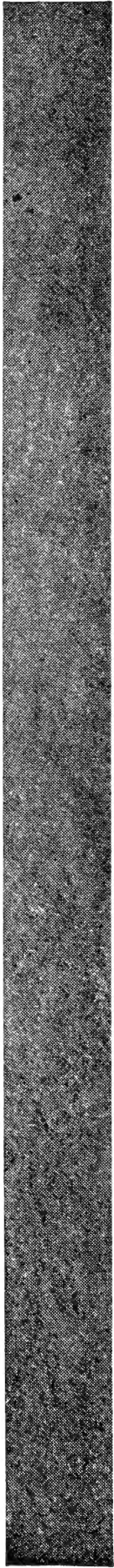
# **TURF AND LAWN PROBLEMS**







Experimental plots of Asgrow turf mixtures and other grasses at our Eastern breeding station





# **TURF AND LAWN PROBLEMS**

Fine turf is not difficult to establish or maintain, provided care is exercised in selection of grasses suited to the particular soil and location, preparation of the seed bed, and application of proper fertilizers. Unthrifty lawns, due to lack of plant food, are ideal locations for weeds to gain a foothold. No amount of herbicide will prove of lasting value unless the specific food requirements of the grass plants are supplied.



## **ASSOCIATED SEED GROWERS, INC.**

Atlanta 2   Cambridge, N.Y.   Indianapolis 4   Los Angeles 21  
Memphis 2   Milford, Conn.   Oakland 7   San Antonio 6  
New Haven 2, Conn.

## LAWN GRASSES

Of the many different species of grasses, only a few are suitable for use in turf. Those commonly used in seed mixtures may be classified as basic (or permanent) grasses and nurse grasses, with a third group of other grasses much less frequently used.

### Basic Grasses

The plants in this group, if once established and given reasonable care, will remain in the lawn indefinitely. A few of the more common species, with some of their distinguishing features, are:

**Kentucky Bluegrass** *Poa pratensis*: Aggressive on favorable soil, spreading rapidly by rhizomes (underground creeping stems). Produces dense, tough sod when cut regularly to a height of one and one-half to two inches; does fairly well in shade. Will fill in when the sod is injured, even when kept in constant use, and is not easily damaged by high temperatures or prolonged drought. Gives best results on fairly fertile soil, slightly acid to neutral in reaction; starts growth early in spring and continues into late fall. Seeds per pound: 2,400,000.

**Canada Bluegrass** *Poa compressa*: Spreads by underground stems as does Kentucky Bluegrass. Should be used only on dry and infertile soils; elsewhere produces an open and unsatisfactory turf. Seeds per pound: 2,400,000.

**Rough-stalk Meadow Grass** *Poa trivialis*: Well adapted to shade where the soil is fertile, neutral to mildly acid, and well watered. Stems and leaf sheaths rough to the touch. Seeds per pound: 2,285,000.

**Colonial Bent**, *Agrostis tenuis*: Spreads by underground rhizomes and some surface stolons. Not so drought tolerant as Kentucky Bluegrass and requires warmer temperature to initiate growth. Will tolerate acid soils but does better when the acidity has been corrected; does not thrive in shade. Desirable for lawns and other closely mowed areas. Seeds per pound: 7,000,000.

**Seaside Bent** *Agrostis palustris*: Spreads very rapidly by surface creeping stolons which root at the nodes. On closely mowed turf, such as golf greens, where top-dressing is possible, it is very satisfactory, but in ordinary lawns the mass of stolons accumulates so greatly that an unhealthy condition results. Does best on fertile soil with moderate acidity and good water holding capacity; is not suited to shade. Seeds per pound: 4,000,000.

**Velvet Bent** *Agrostis canina*: Is likely to be more widely used when better known, since it can be cut short as on golf greens, is tolerant of heavy shade, is drought resistant, and will withstand heat and cold. Seeds per pound: 10,000,000.

**Chewing's Fescue** *Festuca rubra* var. *commutata*: Spreads very slowly; consequently is slow to heal injuries. The blades are fine but tough, which adds considerably to the wearing quality of its turf. Is shade tolerant and will do well on acid, sandy, droughty and infertile soil, but is not tolerant of moist soil. A desirable grass in mixtures for terraces or steep slopes and in mixtures for shady places. Seeds per pound: 600,000.

**Red Fescue (Creeping Red Rescue)** *Festuca rubra*: Hardy and adaptable, tolerant of shade and capable of forming turf even on rather acid soil. Fine-leaved and wiry, giving good wearing qualities. Spreads by underground runners and is a finely-textured grass in mixtures. Seeds per pound: 600,000.

### Nurse Grasses

Grasses in this group germinate speedily, produce a quick growth that protects the soil from washing, furnish shade to seedlings of the slower-growing grasses, and give an early green effect to the seeded area.

**Red Top** *Agrostis alba*: Rarely lives more than three years on turf kept at lawn height, becomes quite coarse during the second year, and alone makes a very undesirable



turf. Tolerant of acid, droughty and infertile soil and does well on wet soil. In the better quality lawn grass mixtures, Red Top is used only as a nurse grass since it gives a fine-textured turf the first year and in later years gives way to the permanent grasses. Seeds per pound: 4,500,000.

Perennial Ryegrass *Lolium perenne*: A short lived perennial, lasting from three to four years. Will furnish a temporary lawn, but as it gets older the sod becomes open. Is coarser than Red Top and the leaves get tough, so that mowing is difficult unless the mower is sharp. Thrives on fertile soil, well drained but with adequate supply of moisture. Seeds per pound: 285,000.

Common Ryegrass *Lolium multiflorum*: Resembles Perennial Ryegrass in general appearance and habit of growth except that it does not live so long and the blades are not so tough. When planted thickly will produce temporary grass in three to four weeks. Too much Ryegrass in a mixture may crowd or choke out slower growing permanent grasses. Seeds per pound: 336,000.

### Other Grasses

These are grasses which have proved unsatisfactory for lawn development in this country and include Timothy, Orchard Grass, Meadow Fox Tail, Crested Dog's-Tail, Tall Oat Grass, Brome Grass and Meadow Fescue. The last named may have a limited use in shade mixtures.

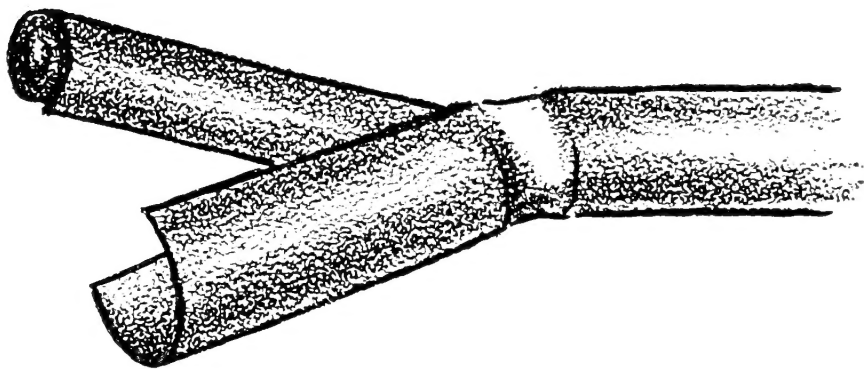
## WHITE DUTCH CLOVER

*Trifolium repens*

White Dutch Clover, while not a grass, is often an ingredient in lawn grass mixtures. Will remain green in dry weather since the roots penetrate much deeper than grass roots and thereby get moisture. The plant spreads by creeping stems at the surface of the soil. It is able to take gaseous nitrogen from the air and convert it into a form which other plants can use. When sown in a lawn it will remain so long as the soil conditions are satisfactory to its growth. Heavy applications of nitrogen will cause the grass to choke clover out; on the other hand, soils deficient in phosphorous and lime make it nearly impossible to maintain a stand.

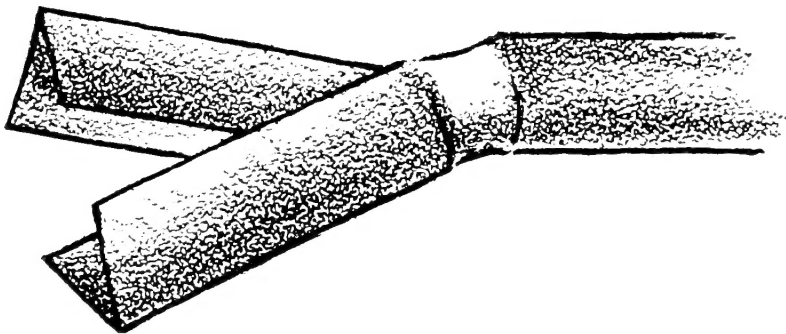
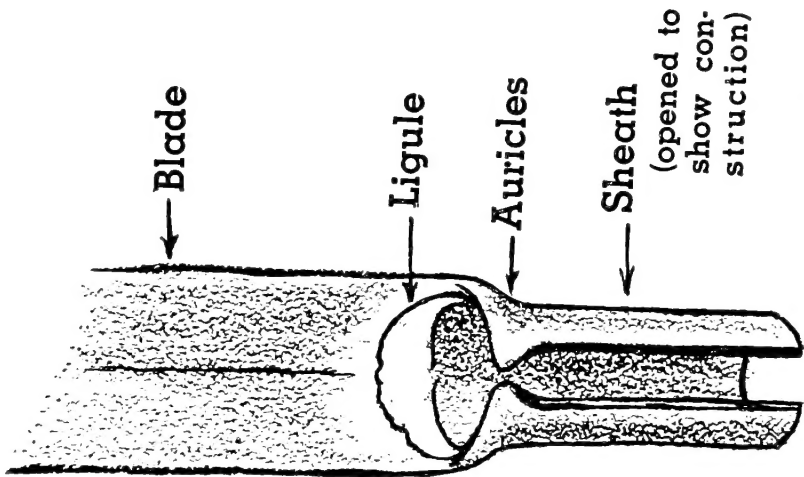


*New varieties of bluegrass are being developed for disease-resistance, adaptation and other desirable characters.*



ROLLED

in column 5, is a tissue-thin structure which prevents water from entering the sheath; it varies considerably in shape. The *sheath* is the basal portion of the leaf which surrounds the stem; it may or may not be provided with small *auricles* at the *collar* which is the joint where the blade bends outward from its sheath.



FOLDED

This drawing illustrates some of the characters mentioned in the tabular analysis on the opposite page, intended as assistance in identifying grasses which have not grown so far as to develop seed heads. The *blade* may be folded, as in Kentucky bluegrass, or rolled as in Red Top. The *ligule*, listed



# CHARACTERISTICS OF GRASS PLANTS

Turf Grass	Blades	Leaf Bud	Stems—Leaf Sheaths	Ligule	Collar—auricles	Root System
Kentucky Bluegrass ( <i>Poa pratensis</i> )	Tip of blade boat-shaped, soft, flat or folded.	Folded	Sheaths somewhat keeled.	Very short and membranous.	Without auricles or hairs.	Spreads by underground creeping stems.
Canada Bluegrass ( <i>Poa compressa</i> )	Bluish color—shorter, wider than Kentucky Bluegrass.	Folded	Flat stems.	Medium long without teeth or notches.		Spreads by underground stem but does not tiller freely.
Rough-stalk Meadow Grass ( <i>Poa trivialis</i> )	Tip of blade boat-shaped. Blades rough to touch.	Folded	Sheaths rough to touch.	Longer than K.B. and toothed at tip.		Short creeping stems at or above ground.
Annual Bluegrass ( <i>Poa annua</i> )	Blades soft, bright green, shorter than Kentucky Bluegrass.	Folded		Medium long without teeth. Broader than in <i>Poa trivialis</i> .		Tillers profusely but does not spread much by creeping stems.
Red Top ( <i>Agrostis alba</i> )	Flat, pointed with definite lines or ribs on upper side. Larger than Creeping Bent.	Rolled	Reddish or purplish tint on sheaths at soil surface.	Long and pointed; much larger than the bents.		Spreads by creeping stems above and below the soil surface.
Colonial Bent ( <i>Agrostis tenuis</i> )	Pointed tips when expanded.	Rolled		Very short as compared to other bents.		Spreads slowly by surface stems and underground creeping stems.
Creeping Bent ( <i>Agrostis palustris</i> )	Narrow and pointed.	Rolled		Long and pointed.		Creeps by surface stems.
Velvet Bent ( <i>Agrostis canina</i> )	Very narrow and pointed.	Rolled		Long, tissue like.	No auricles on collar.	Spreads by short, above-ground stems.
Chewing's Fescue ( <i>Festuca rubra</i> var. <i>commutata</i> )	Wiry, bristlelike, narrow. Pressed together in V shape and appear nearly round.		Old sheaths remain attached as brownish-red fibres.	Short and membranous.		Spreads very little.
Red Fescue ( <i>Festuca rubra</i> )	Stem blades flat, otherwise similar to Chewing's.					Spreads by underground stems.
Meadow Fescue ( <i>Festuca elatior</i> )	Broad, flat, very shiny underside. Rough margined blades.	Rolled		Very short.		Does not have true creeping stems.
Perennial Ryegrass ( <i>Lolium perenne</i> )	Margins smooth.	Folded		Short and membranous.	Auricles very small.	Does not have creeping stems.
Common Ryegrass ( <i>Lolium multiflorum</i> )	Broad and glossy on underside, margins smooth.	Rolled		Very short.	Prominent collar with well developed claw-like auricles.	Does not have creeping stems.
Timothy ( <i>Phleum pratense</i> )	Long, pointed grayish green.			Long and notched.		Does not creep. Stems arise from a swollen or bulblike base.

## FERTILIZER FACTS

### New Turf

A properly prepared seed bed, well supplied with necessary plant foods prior to seeding, should be encouraged since turf is a permanent crop and once established alterations are costly.

Prior to plowing or spading, spread 20-25 pounds of superphosphate to 1,000 square feet of area.

Prior to seeding make an application of 10-20 pounds of a complete fertilizer per 1,000 square feet of area, and work into upper two or three inches of soil. Use a fertilizer high in nitrogen content, such as 10-6-4.

If limestone is to be used, do not apply any fertilizer within 10 days of the limestone application. Where phosphate is applied, liming should, if possible, precede its use by several months. (See page 7 for further information on liming.)

### Turf Maintenance

No one type of fertilizer will meet the requirements of all areas. The proper fertilizer depends upon the condition of the turf and nature of the soil. It can best be determined by soil analysis.

Nitrogen promotes rapid, vigorous growth and is the element most necessary yet most likely to be lacking. In general, it should not be applied in excess of one pound to 1,000 square feet.

Phosphorus promotes root growth and should be in ample supply.

Potash is of value because it helps to maintain a healthy, disease-resistant turf.

Commercial fertilizer should be applied as early as possible in spring and again in fall, on a day when the grass is dry, then thoroughly watered in to avoid burning the grass. Organic fertilizers, if used, should be applied in fall.

Areas which are traversed by tree roots are best fertilized in early fall.

If lime is applied, allow at least 10 days to elapse before applying fertilizer.

If a lawn is infested with crabgrass, do not fertilize in late spring. The proper time is early spring or fall.

Soil should be tested every year or two. Most State Experiment Stations are equipped to give this service.

Material	Average analysis in percentages			Period of influence of nitrogen in number of days			Rate of application in pounds per 1,000 sq. ft.
	Nitrogen	Phosphoric acid	Potash	Start	Peak	End	
Asgrow Lawn Food .....	10	6	4	3	18-25	40	5-10
8-5-3 .....	8	5	3	....	variable	....	6-12
3-12-4 .....	3	12	4	....	variable	....	10-20
Cottonseed Meal .....	6.5	3	2	7	18-22	35	15-20
Soybean Meal .....	6.5	3	2	20	28-32	40	15-20
Milorganite .....	6	2	1	5	12-15	40	15-25
Dried Sheep Manure .....	2	1.5	2	12	17-22	35	50-75
Bone Meal, steamed .....	1-2	22-28	....	20	30-35	45	20-25
Castor Bean Pomace .....	5	2	1	9	25-28	42	16-20
Sulphate of Ammonia .....	21	....	....	3	6-9	16	3-5
Urea .....	46	....	....	8	12-15	25	1-2
Nitrate of Soda .....	16	....	....	1	4-8	15	4-6
Ammo-Phos "A" .....	11	48	....	5	8-12	18	5-8
Ammo-Phos "B" .....	16.5	20	....	5	8-12	18	3-5
Superphosphate .....	0	20	....	....	....	....	20-25
Muriate of Potash .....	0	0	50	....	....	....	2-3



LIME FOR TURF SOILS

1. Lime when applied to turf soils will:  
Correct excessive acidity.  
Improve structure of the soil.  
Increase its ability to absorb water.  
Provide calcium and magnesium.
2. Lime should be applied only when and where a soil test shows that it is needed.
3. The most favorable time for liming soils of established lawns is fall and early spring.
4. Lime is slow in its action at best; therefore it should be applied early in spring or fall.
5. It should be applied when the grass is dry.
6. The beneficial effect of an application of lime on most soils will be evident for two or three years.
7. Where a new lawn is to be made it is best to correct soil acidity as the seed bed is prepared.
8. Do not apply more than 50 pounds of hydrated lime or 75 pounds of ground limestone per 1,000 square feet in any one season. On strongly acid soils repeated applications of lime should be made until the condition is corrected.
9. For established turf, finely ground limestone is somewhat more desirable as it will sift down through the grass into the soil somewhat better than hydrated lime. It is also less likely to damage the grass plants.
10. Fertilizers should not be applied for at least 10 days after an application of lime.

POUNDS OF FINELY GROUND LIMESTONE AND HYDRATED LIME  
REQUIRED TO CORRECT SOIL ACIDITY

Soil acidity expressed in pH* values	Lime per 1,000 square feet of surface in pounds							
	Light sandy		Medium sandy loam		Loam and silt loam		Clay loam	
	Hydrated	Ground lime	Hydrated	Ground lime	Hydrated	Ground lime	Hydrated	Ground lime
pH 4.0	60	90	80	120	115	170	145	215
pH 4.5	55	80	75	110	105	160	135	200
pH 5.0	45	70	60	90	85	130	100	150
pH 5.5	35	50	45	70	65	100	80	120
pH 6.0†	....	....	....	....	....	....	....	....

\* The pH is a figure used to indicate the relative acidity or alkalinity of a given soil. Neutral soils are of pH 7; acid soils are denoted by figures below the alkaline soils by those above pH 7.  
† On some soils 25 pounds hydrated lime or 40 pounds of ground limestone per 1,000 square feet has proved beneficial.



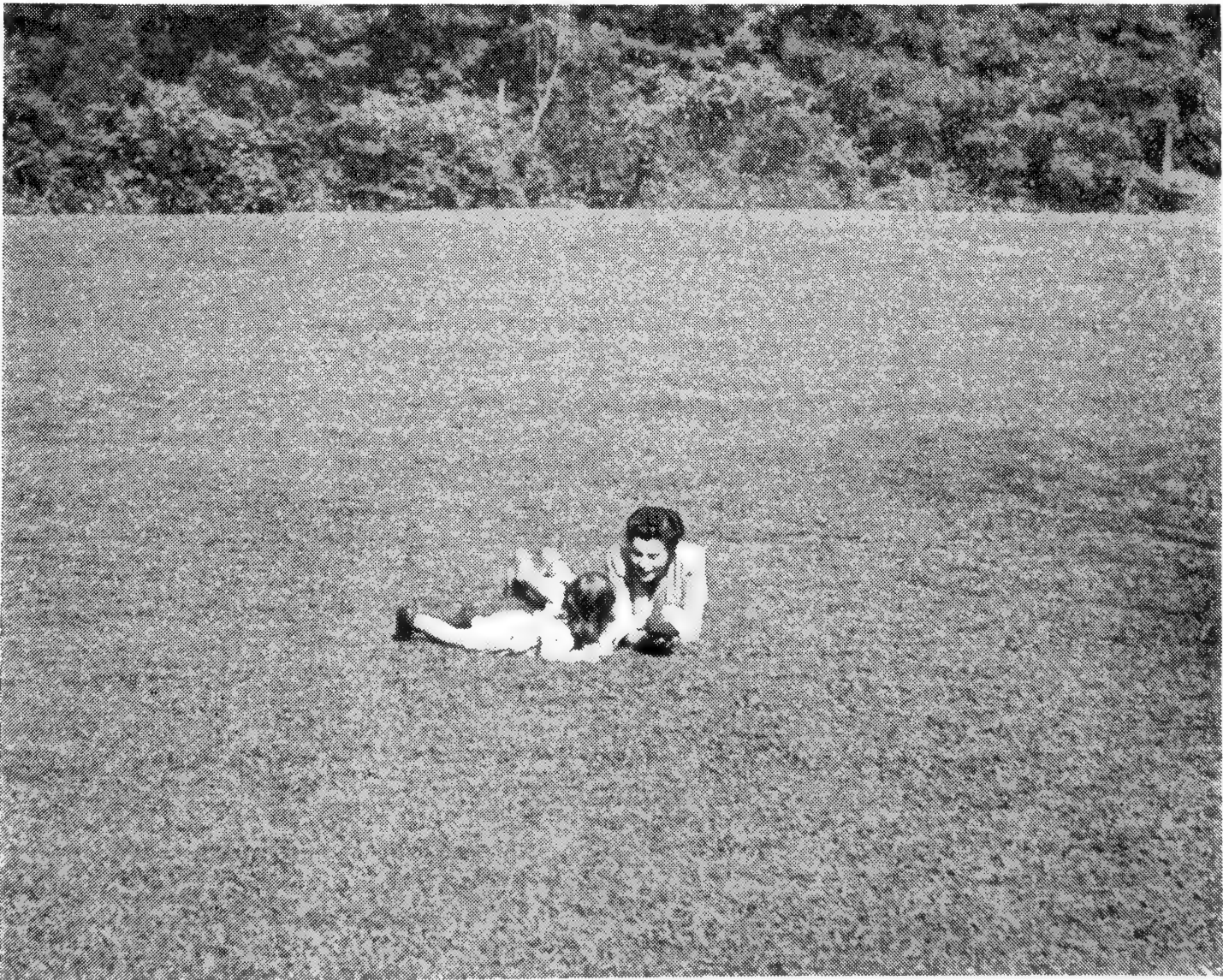
SOIL REACTION (pH Range) OF SOME PLANTS

Common Name	Botanical Name	Minimum pH limit	Optimum pH range	Maximum pH limit
Bluegrass, Annual	<i>Poa annua</i>	5.3	6.0-7.0	
“ Canada	<i>Poa compressa</i>	5.0	6.0-7.5	
“ Kentucky	<i>Poa pratensis</i>	5.0	5.5-7.5	
Bracken, Common	<i>Pteridium latiusculum</i>		4.5-6.0	
Buckhorn	<i>Plantago lanceolata</i>	5.0	5.5-6.5	
Buckthorn	<i>Rhamnus cathartica</i>		6.0-8.0	
Chickweed	<i>Stellaria media</i>		6.0-7.5	
“	<i>Stellaria borealis</i>		4.5-5.5	
“ Mouse Ear	<i>Cerastium arvense</i>		6.0-7.0	
Cinquefoil	<i>Potentilla arenaria</i>		6.0-8.0	
Cinquefoil	<i>Potentilla argentea</i>		5.5-6.5	7.0
“	<i>Potentilla caulescens</i>		6.0-8.0	
“	<i>Potentilla erecta</i>		4.0-5.5	
“	<i>Potentilla saxifraga</i>		6.5-7.5	
Cinquefoil, Dwarf	<i>Potentilla frigida</i>		5.0-6.0	
“ Shrubby	<i>Potentilla fruticosa</i>		6.0-7.0	
“ Wineleaf	<i>Potentilla tridentata</i>		4.5-6.0	
Clover, Alsike	<i>Trifolium hybridum</i>	5.0	5.5-7.5	
“ Hubam	<i>Melilotus alba</i> var. <i>annua</i>	5.0	6.0-7.5	
“ Red	<i>Trifolium pratense</i>	5.5	6.0-7.5	
Clover, Subterranean	<i>Trifolium subterraneum</i>		6.0-7.0	
“ White Sweet	<i>Melilotus alba</i>	5.5	6.5-7.5	
“ Yellow Sweet	<i>Melilotus officinalis</i>	5.5	6.5-7.5	
Clover, White	<i>Trifolium repens</i>	5.0	5.6-7.0	
Cockle, White	<i>Lychnis alba</i>		5.5-7.0	
Daisy, Ox-eye	<i>Chrysanthemum leucanthemum</i>		6.0-7.5	
Dandelion	<i>Taraxacum officinale</i>	5.0	5.5-7.0	8.5
“ Fall	<i>Leontodon autumnalis</i>		5.0-8.0	
Dock, Curled	<i>Rumex crispus</i>		6.0-7.5	
Fescue, Chewing’s	<i>Festuca rubra</i> var. <i>commutata</i>		5.5-6.5	
Fescue, Meadow	<i>Festuca pratensis</i>		4.5-7.0	
“ Red	<i>Festuca rubra</i>		5.5-6.5	
“ Tall or Meadow	<i>Festuca elatior</i>	5.5	6.5-8.0	
Foxtail, Meadow	<i>Alopecurus pratensis</i>	5.0	6.0-7.5	
“ Yellow	<i>Setaria lutescens</i>		5.0-6.5	
“ Green	<i>Setaria viridis</i>		5.0-6.5	
Grass, Barnyard	<i>Echinochloa crusgalli</i>		5.0-6.5	
“ Bermuda	<i>Cynodon dactylon</i>		6.0-7.0	
“ Blue Joint	<i>Calamagrostis canadensis</i>		7.0-8.2	
Grass, Buffalo	<i>Buchloe dactyloides</i>		6.0-7.5	
“ Carpet	<i>Axonopus compressus</i>		6.0-7.0	
“ Colonial Bent	<i>Agrostis tenuis</i>		6.0-7.0	
Grass, Common Rye	<i>Lolium multiflorum</i>	5.0	6.0-7.0	8.0
“ Crab	<i>Digitaria sanguinalis</i>		6.0-7.0	
“ Creeping Bent	<i>Agrostis palustris</i>		6.0-7.0	
Grass, Orchard	<i>Dactylis glomerata</i>	5.5	6.0-7.0	8.0
“ Perennial Rye	<i>Lolium perenne</i>	5.0	6.0-7.0	8.0
“ Quack	<i>Agropyron repens</i>	5.0	5.5-6.5	



SOIL REACTION (pH Range) OF SOME PLANTS—(Continued)

Common Name	Botanical Name	Minimum pH limit	Optimum pH range	Maximum pH limit
Grass, Red Top	<i>Agrostis alba</i>		5.0–6.0	
“ Rhode Island Bent	<i>Agrostis tenuis</i>		4.5–6.0	6.5
“ Rhodes	<i>Chloris gayana</i>		6.0–7.5	
Grass, Seaside Bent	<i>Agrostis palustris</i>	5.0	6.0–7.0	
“ Small Blue	<i>Poa minor</i>		6.0–8.0	
“ Timothy	<i>Phleum pratense</i>		5.5–8.0	
Grass, Velvet Bent	<i>Agrostis canina</i>		5.5–7.0	
Lambs-quarter	<i>Chenopodium album</i>		5.0–7.5	
Moss	<i>Bryum</i> spp., etc.		6.0–8.0	
Pigweed, Rough	<i>Amaranthus retroflexus</i>		5.5–6.5	
Plantain, Bracted	<i>Plantago aristata</i>		5.0–6.5	
Plantain, Common	<i>Plantago major</i>	5.5	6.0–7.5	
“ Narrow-leaved	<i>Plantago lanceolata</i>	5.0	5.5–6.5	
“ Rugel’s	<i>Plantago Rugelii</i>		6.0–7.5	
Rye, Wild	<i>Elymus canadensis</i>		7.0–8.0	
“ Virginian	<i>Elymus virginicus</i>		6.0–8.0	
Self-Heal	<i>Prunella alba</i>		6.0–8.0	
Self-Heal	<i>Prunella grandiflora</i>		6.0–8.0	
Sorrel, Sheep’s	<i>Rumex acetosella</i>		5.5–7.0	
Speedwell, Common	<i>Veronica officinalis</i>		5.5–6.5	
Thyme, Creeping	<i>Thymus serpyllum</i>		5.5–7.0	
Trefoil, Birdsfoot	<i>Lotus corniculatus</i>		5.5–7.0	
“ Yellow	<i>Medicago lupulina</i>		6.0–7.5	
Vervain, Blue	<i>Verbena hastata</i>		5.0–7.5	



## WEED CONTROL

The eradication of weeds by digging, spraying or other means is of little permanent value unless these operations are part of a planned turf maintenance program. A healthy thick turf will crowd out many weeds and prevent others from securing a foothold. In order to have such a turf the requirements are: timely applications of fertilizer, sufficient water during the summer and proper mowing to benefit the grass plants.

Weeds of turf and lawn may be classified into three types:

The low-growing, creeping, or trailing forms, such as chickweed, speedwell, ground ivy, heal-all and pennywort;

The rosette-forming weeds, such as dandelion and the narrow and broad-leaf plantains; and

The grassy weeds, such as crabgrass, foxtail, and goosegrass.

**Control:** Three classes of weed-control measures are used:

Crowding or shading out with a heavy, dense, close-knit turf of desirable permanent grasses.

Manual control, effected by digging, pulling, clipping, and in some instances complete renovation of the turf, followed by reseeding or sodding.

Chemical control. (Page 11).

It is often necessary to use more than one method of weed control to secure the desired results since soil and climatic conditions as well as vegetative cover vary from locality to locality. It is to be noted, therefore, that the practices outlined in the following pages are not necessarily applicable in every case.

## CROWDING AND SHADING

Most weeds cannot stand competition, and do not usually appear where there is a dense, luxuriant growth of grass; on the contrary they flourish in patchy, under-nourished, close-mowed areas where the grass makes feeble growth.

A fertilizer program should be so planned as to stimulate the growth of grass in fall and early spring. This will help to choke out weeds and prevent others from getting a foothold. If crabgrass is present the lawn should not be fertilized in late spring or early summer because crabgrass germinates late in the season, and any fertilizer applied late will stimulate the growth of crabgrass to the detriment of the desirable grasses. Organic fertilizers should not be applied to crabgrass-infested lawns in the spring. Fertilizing in fall or early spring will give sturdy growth, thereby producing a dense turf that will help to crowd out the crabgrass. This procedure will also be helpful in controlling many other lawn weeds.

During the summer months (June to August) the lawn should be mowed less frequently and cut to a height of two inches. This will tend to discourage weed growth, especially annuals, due to a combination of crowding and shading. It will also be found helpful in the control of crabgrass.

## INDIVIDUAL PLANT TREATMENT

An effective if somewhat laborious treatment is cutting the plant below the surface of the ground. One cutting or digging of perennial weeds will not always kill them; this is especially true of dandelions. These plants have a long tap root capable of sending out new shoots to a considerable depth, but continual cutting of new growth will in time exhaust the food reserves in the root and result in the death of the plant. A pinch of dry salt or a few drops of gasoline on the cut section of perennial plant roots will materially retard and often prevent the recovery of the plants.

Annual and most perennial weeds can be controlled by pulling the plant up root and all. Where plants are few and scattered this may be the most practical means of eradication.

## CHEMICAL CONTROL

Several selective weed killers, such as Lawn Sinox, iron sulphate, arsenical compounds, chlorates and kerosene, all now appear destined to be replaced by the herbicide 2,4-D (dichloro-phenoxyacetic acid).

The weed killing action of 2,4-D is based on its growth-regulating properties, which usually affect the broad leaved plants (including most weeds) and not the narrow leaved (including most lawn grasses). It is somewhat injurious to white clover and bent grasses and should be used with caution on lawns containing these plants.

The United States Golf Association Green Section, in co-operation with the United States Department of Agriculture, reports 2,4-D effective in control of certain weeds to the degree indicated below:

XX Satisfactory eradication at recommended rates

X Weeds which have required much higher rates

O Strikingly resistant

No symbol Evidence at hand does not justify a conclusion

O Bugleweed ( <i>Ajuga reptans</i> )	O Nimblewill
XX Buttercup ( <i>Ranunculus</i> spp.)	( <i>Muhlenbergia Scheberi</i> )
Carrot, wild ( <i>Daucus carota</i> )	XX Onion, wild ( <i>Allium</i> spp.)
Catchfly ( <i>Silene</i> spp.)	O Paspalum ( <i>Paspalum</i> spp.)
XX Chaerophyllum	XX Pennywort
( <i>Chaerophyllum procumbens</i> )	( <i>Hydrocotyle bonariensis</i> )
XX Chickweed, common	XX Pennywort
( <i>Stellaria media</i> )	( <i>Hydrocotyle rotundifolia</i> )
XX Chickweed, mouse-ear	XX Pennywort ( <i>Hydrocotyle umbellata</i> )
( <i>Cerastium</i> spp.)	XX Peppergrass ( <i>Lepidium virginicum</i> )
XX Cinquefoil ( <i>Potentilla</i> spp.)	XX Plantain, broad-leaf
XX Clover, white ( <i>Trifolium repens</i> )	( <i>Plantago major</i> )
O Crabgrass ( <i>Digitaria</i> spp.)	XX Plantain, narrow-leaf
XX Cress ( <i>Barbarea vulgaris</i> )	( <i>Plantago lanceolata</i> )
XX Cress, swine ( <i>Coronopus didymus</i> )	XX Purslane, milk ( <i>Euphorbia maculata</i> )
Daisy, ox-eye	XX Pussy toes
( <i>Chrysanthemum leucanthemum</i> )	( <i>Antennaria plantaginifolia</i> )
XX Dandelion ( <i>Taraxacum officinale</i> )	Ragweed ( <i>Ambrosia artemisifolia</i> )
Dandelion, false ( <i>Krigia virginica</i> )	O Sedges ( <i>Cyperus</i> spp.)
XX Dichondra ( <i>Dichondra repens</i> )	XX Shepherd's-purse
XX Dock ( <i>Rumex</i> spp.)	( <i>Capsella bursa-pastoris</i> )
Dog fennel ( <i>Anthemis cotula</i> )	X Smartweed ( <i>Polygonum persicaria</i> )
XX Fleabane ( <i>Erigeron canadensis</i> )	X Sorrel, [sheep's] ( <i>Rumex acetosella</i> )
O Goosegrass ( <i>Eleusine indica</i> )	O Sorrel, wood ( <i>Oxalis</i> spp.)
XX Ground ivy ( <i>Nepeta hederacea</i> )	XX Speedwell ( <i>Veronica tournefortii</i> )
XX Heal-all ( <i>Prunella vulgaris</i> )	XX Speedwell, rock ( <i>Veronica arvensis</i> )
XX Henbit ( <i>Lamium amplexicaule</i> )	Sticktight ( <i>Bidens</i> spp.)
XX Knotweed ( <i>Polygonum aviculare</i> )	XX Strawberry, false ( <i>Duchesnea indica</i> )
X Lambs-quarter ( <i>Chenopodium album</i> )	XX Veronica, ivy-leaved
XX Lespedeza ( <i>Lespedeza striata</i> )	( <i>Veronica hederifolia</i> )
XX Lippia ( <i>Lippia</i> spp.)	O Violet ( <i>Viola</i> spp.)
XX Moneywort ( <i>Lysimachia nummularia</i> )	XX Whitlow grass ( <i>Draba verna</i> )
XX Mustard, wild ( <i>Brassica</i> spp.)	Wormwood ( <i>Artemisia</i> spp.)
	Yarrow ( <i>Achillea millefolium</i> )

As a result of further research, other weeds will undoubtedly be added to this list, and some of those that now appear to be resistant may be killed under proper treatment. In using 2,4-D, therefore, follow closely the directions furnished by the manufacturer.



## SOME INSECT PESTS

**WHITE GRUBS:** Grubs of various species cause damage to turf by feeding on the roots of grass plants, usually about an inch below the soil surface, though if the upper layer be dry they will burrow downward until they reach a satisfactory degree of moisture. Of white grubs, larvae of the Japanese beetle and Asiatic beetles are considered the most destructive.

**Control:** Hitherto the most effective treatment for the eradication of white grubs has been the application of lead arsenate at the rate of ten pounds per 1,000 square feet, or five pounds where the infestation is light. This chemical is effective but is very poisonous and seems likely, therefore, to be superseded by some of the more recently introduced insecticides, such as DDT, which are less dangerous and less expensive. Recommendations on the use of such preparations are given on their containers or are available from State Agricultural Experiment Stations.

### CHINCH BUGS

The chinch bug is a sucking insect, about one-eighth of an inch long, which injures the grass by puncturing the stems and sucking the plant juices. When the chinch bugs are numerous the grass is killed, leaving only clover and weeds which are not attacked by the bugs. The bugs can be easily discovered by parting the grass and examining the crowns of the grass where they mostly feed.

**Control:** Since the chinch bug is a sucking insect it is necessary to use a contact poison. The following treatments have been effective:

**DDT:** This new insecticide shows considerable promise when used as a surface dust in accordance with recommendations of the manufacturer.

**Nicotine Dust:** Three to four per cent actual nicotine applied at six to ten pounds per 1,000 square feet. Brush in soon after application. Apply during the warm part of the day.

**Derris Dust (Rotenone):** Apply 25 pounds to 1,000 square feet, during warm part of the day. Brush in soon after application.

**Nicotine Soap Spray:** One quart of nicotine sulphate and one gallon of liquid potassium oleate soap in 100 gallons of water. Spray at the rate of 150 gallons per 1,000 square feet. May cause some injury to grass and is more costly than the other methods.

Sabadilla dust, made from ground up seeds of the Sabadilla plant, has given over 95 per cent reduction to chinch bugs in recent tests when applied at the rate of 2-3 pounds of 10 per cent Sabadilla per 1,000 square feet on bent grass lawns.

**Time of application:** There are two generations of chinch bugs a year. The first hatches during May and June, the second in late July and August. Injury is therefore most severe in July and again in September when the bugs of each generation are reaching maturity and feeding most heavily. Depending on locality and season, treatments should be made June 1st to June 15th for the first brood and August 1st to August 15th for the second brood.

Chinch bugs are more injurious on bent grass turf than on fescue and bluegrass.

### SOD WEBWORMS

Sod webworms are the young or larvae of several species of small grayish or brownish moths, frequently observed flying about over turf grass, particularly during the early evening. These moths drop their eggs at random during flight. The young worms hatch from the eggs in a week or ten days and feed for a time on tender grass blades. As they grow larger they work down into the crowns of the grass and build, on or just beneath the surface of the soil, silk-lined tunnels or burrows covered with bits of earth. Sod webworm injury first appears as small brown areas in the grass. As

the worms grow larger the injured areas become ragged and unhealthy in appearance and large areas may be killed.

**Important:** The appearance of the small silk-lined tubes among the crowns of the grass and on the surface of the soil is proof of sod webworm infestation.

**Control:** Lead Arsenate (See under White Grubs).

**Pyrethrum-extract spray:** Commercial pyrethrum-extract plant sprays diluted as recommended by the manufacturer for moderately resistant insects and applied at the rate of about 110 gallons per 1,000 square feet.

**Home-made kerosene emulsion:** Mix thoroughly one part kerosene to 50 parts of water and apply about 110 gallons per 1,000 square feet.

CUTWORMS, ARMY WORMS AND GRASSHOPPERS

Occasionally cutworms, army worms, and grasshoppers occur in sufficient numbers to require some control measure. The injury caused by cutworms and army worms may be similar to that caused by sod webworms but the absence of the silk-lined tubes will clearly show that sod webworms are not the cause.

**Control:** Cutworms and army worms in turf may be controlled by pyrethrum sprays, applied as recommended for the control of sod webworms. One of the oldest control practices for these pests as well as grasshoppers is the use of a poison bran mash made as follows:

	5-lb. lot	20-lb. lot
Wheat Bran .....	5 lbs.	20 lbs.
Paris Green or White Arsenic .....	4 ozs.	1 lb.
Molasses or Syrup .....	1 pint	2 quarts
Water .....	1 quart	5 quarts

Thoroughly mix the dry materials (wheat bran and arsenical) together. Then mix the molasses and water in another container. Next mix the dry and liquid materials together. This mixture should be made four to five hours before it is to be used. There should be enough moisture in the mixture to ball when squeezed in the hand, but not enough to squeeze out water.

The mixture should be scattered lightly but evenly over the infested area at a rate of one pound to each 2,500 square feet. For cutworms apply it in the evening; for army worms and grasshoppers, in the morning. While poison bran is effective against the pests it is also liable to be eaten by birds and dogs; many people, therefore, prefer to use one of the commercial preparations which are poisonous only to the insects.

EARTHWORMS

Earthworms occasionally are regarded as pests because the casts of soil which they deposit on the surface are unsightly on lawns and objectionable on putting greens, but this condition is only likely to occur when the soil is rich in organic matter. They are most abundant during wet weather, working deeper during the dry weather.

**Control:** Lead arsenate at the rate of five or six pounds per 1,000 square feet is the most generally used means of control for earthworms. The dry arsenate should be mixed with sand or soil for easier application, then watered in. Where it is desired not to use such a poisonous chemical, Mowrah meal can be substituted. This organic preparation is made from seeds of an Asiatic tree and has some value as a fertilizer. The recommended rate is 15 pounds per 1,000 square feet applied dry and watered in.



## ANTS

Ants may be troublesome in lawns and on golf courses, making the surface uneven by throwing up earth around their burrows.

**Control:** To get rid of ants permanently, the queen ant in each nest must be killed.

**Calcium cyanide (Cyanogas):** Make a hole in the center of the nest about four to six inches deep with, for example, a screwdriver; then force from the container in which purchased a few puffs of the powder and close the opening of the nest with soil.

**Caution:** Calcium cyanide is a deadly poison to people and animals; precautions as printed on the container should therefore be observed. Care should be taken not to spill it on the grass.

**Carbon bisulphide:** By means of a small pressure oil can, inject into the opening of the ant nest a squirt or two of the liquid and cover with moist soil or wet burlap in order to keep in the gas that is formed as the material volatilizes.

**Caution:** Carbon bisulphide is very inflammable, is highly poisonous and is injurious to grass.

Pyrethrum powder may be similarly injected into the nests; it is not harmful to the grasses.

**Tartar emetic:** Mix one part of tartar emetic, four parts brown sugar and three parts corn meal. Moisten with water and scatter over the infested area. As it is poisonous, children, pets and poultry should not have the run of treated areas.

Several good commercial products are on the market, to be used according to the directions given by the manufacturer.





## DISEASES

Turf areas are often attacked by fungous diseases, of which Brown Patch (Large Brown Patch) and Dollar Spot (Small Brown Patch) are probably the most common.

**BROWN PATCH:** This disease produces irregularly shaped brown areas, more or less circular in outline, varying from an inch to three or more feet in diameter. At first there is a rapid wilting of the leaves, followed by browning and finally death of the plants.

**DOLLAR SPOT:** Affects small areas (about the size of a silver dollar) of the turf; at first the grass appears dark and water-soaked then turns yellowish to light straw colored. As the disease spreads and the spots become more numerous the turf takes on a bleached and unsightly appearance.

**Control:** For both diseases.

**Cultural Practices:** Remove the dew by early watering, or dragging a light object over the area. Professional gardeners and greens keepers often use a long pole brushed across the grass.

Provide good surface and subsurface drainage.

Provide sunlight and free circulation of air.

Regulate fertilizer application to avoid soft, tender growth of the grass.

Excessive acidity tends to favor the disease.

**Chemical Treatment:** Two ounces of calomel (mercurous chloride) with one ounce of corrosive sublimate (mercuric chloride) mixed with four quarts of dry, screened sand spread on 1,000 square feet of turf. Frequency of application will be determined by the season and past record of the disease. As a preventive an application of two ounces to 1,000 square feet every ten days is usually effective. A light watering should follow each application in order to wash the mercury from the leaves. During hot, humid weather, not more than two ounces per 1,000 square feet should be applied.

**Caution:** Compounds of mercury are poisonous to animals, including man.

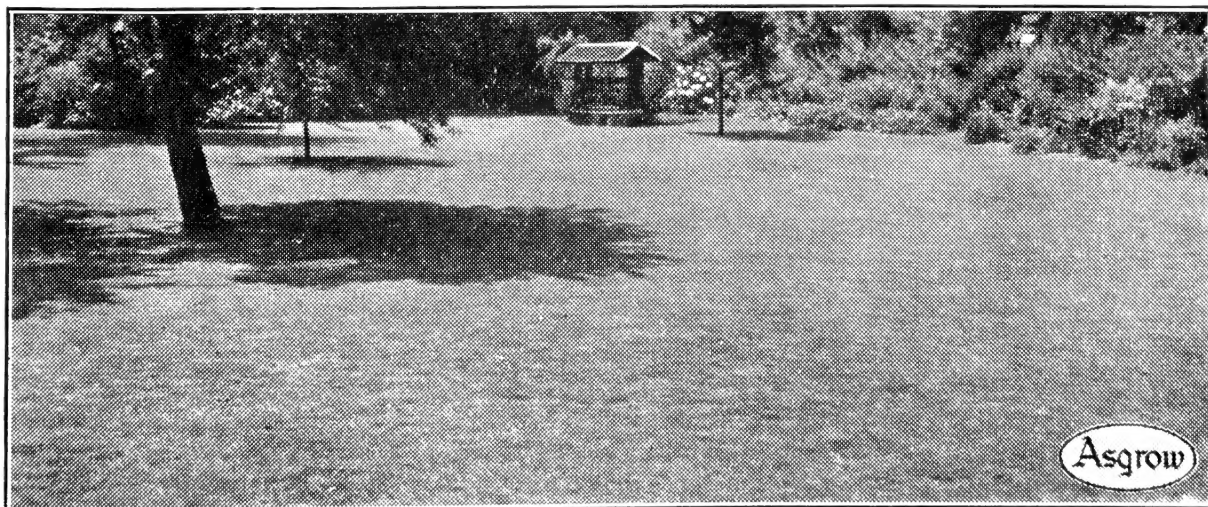
There are on the market two products which have considerable value in the control of brown patch and dollar spot: Tersan, manufactured by Bayer-Semesan Co.; and Spergon, manufactured by the U. S. Rubber Co.

**SNOWMOLD:** This disease is prevalent during winter or early spring, usually when snow is present or just melting. It appears first as a thick, cottony growth on the turf which may extend over an area several feet in diameter.

**Control:** Any treatment which will hasten the drying of the surface soil when spring thaws begin will aid in the control of snowmold.

Late fall applications of fertilizer should be avoided where there is danger of snowmold.

Corrosive sublimate and calomel applied in late fall at the rate of two to five ounces per 1,000 square feet is beneficial.



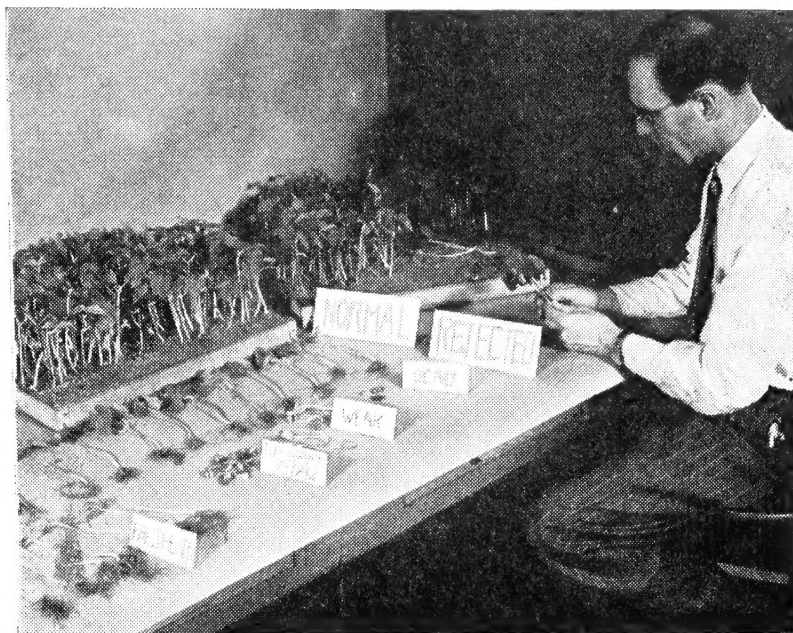
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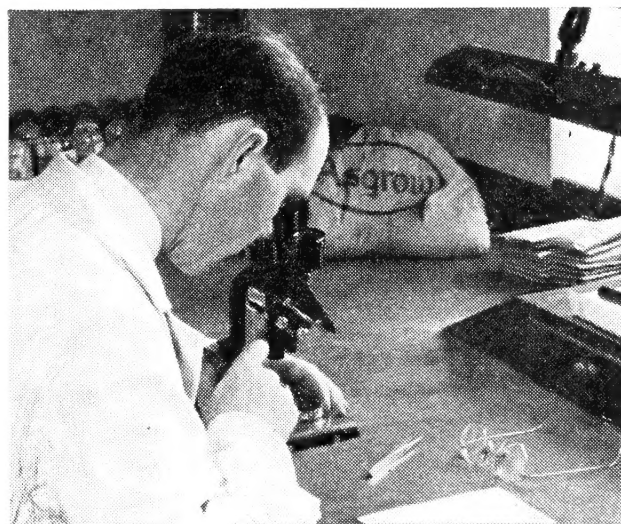
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## The Asgrow Germination and Analytical Laboratory



In addition to the field tests carried on at our experimental plots shown on the inside front cover, purity and germination tests and other studies are conducted in the Asgrow central laboratory at New Haven, Conn. The best available equipment is used, including room germinators in which temperature and humidity are accurately controlled and the lighting is by fluorescent lamps. Complete and accurate records are made of all operations in the laboratory and retained for at least a year in a systematic file, so that where necessary the growing performance of any given lot of seed may afterwards be compared. These operations are all part of a continuous program to make high and dependable quality available to users of Asgrow seeds.



*Above: The binocular microscope is used for detailed studies.*

*Left: Pathological tests.*

**Associated Seed Growers, Inc., New Haven 2, Conn.**



